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The Mutational Study of SARS-CoV-2 Variant: Omicron (B.1.1.529) and Pandemic Situation



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ABSTRACT

The recent identification of the highly mutated SARS-CoV-2 variant was first reported in South Africa. The new covid variant is namedOMICRON (B.1.1.529). WHO has designated the new variant as a "Variant of concern". Omicron contains a large number of mutations on the spike protein and is at least three times more infectious than the original SARS-CoV-2. There is no adequate information on omicron that needs to be known.



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INTRODUCTION:

A coronavirus is a kind of common virus that causes an infection in your nose, sinuses, or upper throat. In early 2020, after a December 2019 outbreak in China, the World Health Organization identified SARS-CoV-2 as a new type of coronavirus. The outbreak quickly spread around the world. COVID-19 is a disease caused by SARS-CoV-2 that can trigger what doctors call a respiratory tract infection. It can affect your upper respiratory or lower respiratory tract. It spreads the same way other coronaviruses do, mainly through person-to-person contact. Infections range from mild to deadly.

SARS-CoV-2 is one of seven types of coronavirus, including the ones that cause severe diseases like the Middle East respiratory syndrome (MERS) and sudden acute respiratory syndrome (SARS). The other coronaviruses cause most of the colds that affect us during the year but aren't a serious threat to otherwise healthy people.

Throughout the period, the virus developed to adapt to humans. These mutations have led to the evolution of a new variant which was first identified from a specimen collected on 9 November 2021 and the first sequenced omicron case was reported by the World Health Organisation (WHO) on November 26, 2021, in South Africa. The Technical Advisory Group on SARS CoV-2 Virus Evolution (TAG-VE) is an independent group of experts that periodically monitors and evaluates the evolution of SARS CoV-2 and assesses if specific mutations and combinations of mutations alter the behavior of the virus. Preliminary evidence suggests an increased risk of reinfection with this variant, as compared to other VOCs.

On 26 November 2021, WHO designated variant B.1.1.529 a variant of concern, named Omicron, on the advice of WHO's Technical Advisory Group on Virus Evolution (TAG-VE). This decision was based on the evidence presented to the TAG-VE that Omicron has several mutations that may have an impact on how it behaves, for example, on how easily it spreads or the severity of illness it causes. Here is a summary of what is currently known.

Effectiveness of prior SARS-CoV-2 infection

Preliminary evidence suggests there may be an increased risk of reinfection with Omicron (i.e, people who have previously had COVID-19 could become reinfected more easily with Omicron), as compared to other variants of concern, but the information is limited. More information on this will become available in the coming days and weeks.

Effectiveness of vaccines: WHO is working with technical partners to understand the potential impact of this variant on our existing countermeasures, including vaccines. Vaccines remain critical to reducing severe disease and death, including against the dominant circulating variant, Delta. Current vaccines remain effective against severe disease and death.

Effectiveness of current tests: The widely used PCR tests continue to detect infection, including infection with Omicron, as we have seen with other variants as well. Studies are ongoing to determine whether there is any impact on other types of tests, including rapid antigen detection tests.

Effectiveness of current treatments: Corticosteroids and IL6 Receptor Blockers will still be effective for managing patients with severe COVID-19. Other treatments will be assessed to see if they are still as effective given the changes to parts of the virus in the Omicron variant.

Current knowledge about Omicron

Researchers in South Africa and around the world are conducting studies to better understand many aspects of Omicron and will continue to share the findings of these studies as they become available.

Transmissibility: It is not yet clear whether Omicron is more transmissible (e.g., more easily spread from person to person) compared to other variants, including Delta. The number of people testing positive has risen in areas of South Africa affected by this variant, but epidemiologic studies are underway to understand if it is because of Omicron or other factors.

The severity of disease: It is not yet clear whether infection with Omicron causes more severe disease compared to infections with other variants, including Delta. Preliminary data suggests that there are increasing rates of hospitalization in South Africa, but this may be due to increasing overall numbers of people becoming infected, rather than a result of a specific infection with Omicron. There is currently no information to suggest that symptoms associated with Omicron are different from those from other variants. Initially reported infections were among university students—younger individuals who tend to have the more mild disease—but understanding the level of severity of the Omicron variant will take days to several weeks. All variants of COVID-19, including the Delta variant that is dominant

worldwide, can cause severe disease or death, in particular for the most vulnerable people, and thus prevention is always key.

Studies underway

At present, WHO is coordinating with a large number of researchers around the world to better understand Omicron. Studies currently underway or underway shortly include assessments of transmissibility, the severity of infection (including symptoms), the performance of vaccines and diagnostic tests, and the effectiveness of treatments. WHO encourages countries to contribute to the collection and sharing of hospitalized patient data through the WHO COVID-19 Clinical Data Platform to rapidly describe clinical characteristics and patient outcomes. More information will emerge in the coming days and weeks. WHO's TAG-VE will continue to monitor and evaluate the data as it becomes available and assess how mutations in Omicron alter the behavior of the virus.

Recommended actions for countries

As Omicron has been designated a Variant of Concern, several actions recommends countries to undertake, including enhancing surveillance and sequencing of cases; sharing genome sequences on publicly available databases, such as GISAID; reporting initial cases or clusters to WHO; performing field investigations and laboratory assessments to better understand if Omicron has different transmission or disease characteristics, or impacts the effectiveness of vaccines, therapeutics, diagnostics or public health and social measures.

Recommended actions for peoples

Countries should continue to implement effective public health measures to reduce COVID-19 circulation overall, using risk analysis and a science-based approach. They should increase some public health and medical capacities to manage an increase in cases. WHO is providing countries with support and guidance for both readiness and response. It is important that inequities in access to COVID-19 vaccines are urgently addressed to ensure that vulnerable groups everywhere, including health workers and older persons, receive their first and second doses, alongside equitable access to treatment and diagnostics.

The most effective steps individuals can take to reduce the spread of the COVID-19 virus are to keep a physical distance of at least 1M from others; wear a well-fitting mask; open windows to improve ventilation; avoid poorly ventilated or crowded spaces; keep hands clean; cough or sneeze into a bent elbow or tissue, and get vaccinated when it's their turn.

WHO will continue to provide updates as more information becomes available, including following meetings of the Technical Advisory Group on SARS-CoV-2 Virus Evolution (TAG-VE). In addition, information will be available on WHO's digital and social media platforms.

Mutation of SARS CoV-2 strain:

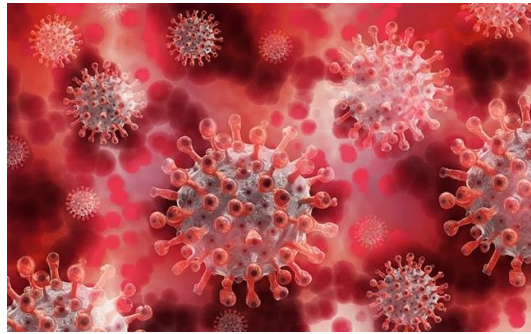


Fig 1: Mutation of SARS CoV-2 strain

Mutations are a natural evolutionary outcome in any viral propagation. Any virus runs into a huge number of evolutions in the body of the host by losing/ acquiring amino acids. That change in the configuration may result in three mechanisms such as either deletion or substitution or insertion of an entire gene sequence in the virus.

Mutation of SARS CoV-2 variant is higher in spike protein than the remaining proteome. It was noted that 32 out of 50 mutations of omicron are on the spike protein. Mutations in spikes are predicted to affect changes in SARS-CoV-2 characteristics such as transmissibility, pathogenicity, immune escape, and other viral properties.

Mutations in Omicron show that there is a unique insertion mutation in Omicron's N-terminal domain around the S1/S2 FURIN cleavage site. in the spike S protein that engages the ACE receptor on human cells that facilitate viral entry missense has led to significant changes in the spikeace2 binding affinity and deletions have modulated the effect of neutralizing anti-spike antibodies. Insertions are less common but are having a particular interest as they require a unique RNA sequence on aligning the spike protein nucleotide sequences from Omicron and the reference Wuhan SARS CoV-2 sequences show that two different nucleotide sequence insertions can give rise to the sequencing encoding Omicron's ins214EPE. The insertion mutation ins214EPE has not been previously observed in any SARS CoV-2 other than Omicron. But the substitution and deletion mutations have appeared

in previous SARS-CoV-2 lineages. The EPE insertion in Omicron appears to be novel although position 214 appears to be an insertion hotspot.

Vaccination:

Presently **COVAXIN** and **COVISHIELD** vaccines are available for covid variants. These are resistant to any other form of mutational variant. But still no evidence to fight against all the variants. Currently, the Government of India has announced vaccines also for children aged over 15 years.

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